Expanding the Range of Possibility

Exploring the Uncertainty in Projecting Ozone-Related Health Effects of Climate Change

Shifts in concentrations of ground-level ozone (O_3) are one of the projected outcomes of climate change, although estimates of the magnitudes, locations, and impacts of these shifts vary. A team of researchers assessed several prediction scenarios of climate change between 2000 and 2050 to see how different modeling choices affect estimates of O_3-related human health effects [***EHP* 120(11):1559–1564; Post et al.**]. The goal of this study was to explore the extent of the uncertainty that surrounds different modeling choices.

The team evaluated seven climate change models (and their embedded assumptions about meteorology and atmospheric chemistry), each linked to an air quality model. They also evaluated five population projections as well as concentration–response relationships (i.e., anticipated adverse health effects of different O_3 levels) based on selected epidemiological studies used to support the U.S. Environmental Protection Agency's National Ambient Air Quality Standards for O_3. The climate change models defined the "O_3 season" as June–August, although most epidemiological studies of O_3-related health effects typically assume a longer season of May–September. This suggested to the researchers that their health effect estimates may be conservative.

Three-fourths of the 105 scenarios predicted an increase in nonaccidental O_3-related summertime deaths in the lower 48 states, but in a wide range, from 10 to 2,560; 23% of the scenarios predicted a decrease in deaths ranging from 10 to 650, and 3% predicted no change. Roughly parallel findings—with wide ranges of effects, and most scenarios predicting worsening outcomes—were seen for estimated morbidity impacts such as lost school days and minor restricted-activity days. There were large differences in both magnitude and direction in predicted health effects at the regional scale.

The researchers attributed the greatest variations in predicted health effects to differences in the linked climate change–air quality models, although the population models and concentration–response relationships also had significant impacts on the final estimates.

Consistent with any predictive effort that involves significant uncertainty, the researchers conclude that researchers and policy analysts should similarly consider multiple prediction scenarios for each component of their analyses, enabling a better assessment of the range of possible effects. That approach contrasts with previous projections of climate change/O_3-related health impacts cited by the researchers, all of which utilized much narrower ranges of inputs than the current study.

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Proximity Plus Pollution

Understanding Factors in Asthma among Children Living near Major Roadways

Compact urban development would reduce urban sprawl, leading to shorter driving distances and ultimately less regional air pollution. But it would also mean greater housing density in a given area, potentially increasing the number of residences near major roadways. Given that exposure to traffic emissions near roadways is strongly associated with asthma and related symptoms in children, a new study focuses on how air pollution reduction paired with changes in the proportion of children living near major roadways might affect overall rates of asthma-related outcomes within an urban population [***EHP* 120(11):1619–1626; Perez et al.**].

Near-roadway housing in Los Angeles, CA

Traditionally, studies of air pollution and asthma have focused on acute effects—that is, exacerbation of asthma symptoms caused by traffic-related exposure. This work distinguishes between direct effects of regional pollution on asthma symptoms and longer-term effects of living near a roadway on the development of asthma.

Previously collected data were used to estimate the prevalence of asthma and the occurrence of asthma-related outcomes (e.g., bronchitis episodes) in Los Angeles County in 2007. Los Angeles County roadway locations were paired with census and community data to determine the proportion of children living within 75 m of a major roadway. Monitoring stations provided annual average daily concentrations of sample regional traffic-related and secondary pollutants.

Nearly 18% of Los Angeles County children lived within 75 m of a major roadway. The authors estimated that approximately 27,100 asthma cases (8% of the total reported) could be at least partly attributed to living near a major roadway, whereas the combined effects of traffic proximity and regional nitrogen dioxide explained an estimated 70,200 episodes of bronchitis among children with asthma. If regional pollution were reduced by 20% but 3.6% more children (based on total county population) lived near a major roadway, an estimated 5,900 more cases of asthma would occur; if 3.6% fewer children lived by a major roadway with the same reduction in pollution, the estimated number of cases would drop by 5,900.

Reducing regional pollution by 20% would result in 19,900 fewer episodes of bronchitis, assuming 3.6% fewer children lived close to a major roadway. There would be 15,580 fewer episodes if the 20% decrease in regional pollution was accompanied by a 3.6% increase in proportion of children living near major roadways.

The results underscore the importance of considering near-roadway pollution exposures in urban planning, especially since these exposures may also contribute to atherosclerotic heart disease, chronic obstructive pulmonary disease, lung cancer, and adverse childhood neurodevelopmental outcomes. They conclude that compact urban design should be accompanied by strategies to mitigate exposure to near-roadway pollution.

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